



SCORED EVENTS AND AWARDS

QUALIFYING: BRAKING AND DYNAMIC SAFETY EVALUATION

Pass/Fail

Event Captain: Ralph Brazel – General Motors

The purpose of the braking and dynamic safety event is to evaluate the safe functionality of the competition vehicles prior to competing in any other dynamic events. The event utilizes tests that are currently used in real-world vehicle design programs to ensure that vehicles are safe to operate at city and highway speeds, as well as bring the vehicles to a controlled stop in a safe distance relative to the production vehicle.

VEHICLE DYNAMICS HANDLING EVENT (VDTA HANDLING)

30 points

Event Captain: Mike Neal – General Motors

After passing the qualifying braking and dynamic safety evaluation event, teams will demonstrate their vehicle's ability to navigate a serpentine cone-lined course and test the vehicle's handling capabilities. Teams are given multiple attempts to drive their vehicle through the handling course, in the shortest time possible. The event will run similar to an autocross format, with teams completing the course driving solo. Teams are allowed the option to select a General Motors professional driver, a driver from their own team, or a combination to put forth a best effort in the event.

The team with the lowest time through the handling event will receive a trophy for Best Dynamic Handling and a check for \$500.

QUALIFYING: ACCELERATION

40 points

Co-Event Captains: Dan Molnar and Ed Galubensky – General Motors

The Acceleration Event will evaluate teams' ability to accelerate in two different metrics: The first acceleration is from a complete stop to 60 mph, and the second acceleration is from 50 to 70 mph. Teams are challenged to demonstrate the best acceleration possible given their vehicle architecture design. Furthermore, teams are required to model their vehicle and be able to predict their actual performance computationally with a certain percentage of the points associated with their modeling accuracy.

The team demonstrating the highest score based on their acceleration times will receive the award for the Best Acceleration and a check for \$500.

QUALIFYING: LIMITED TRACTION CONTROL

40 points

Event Captain: Dwight Schoenfeld – General Motors

This event will demonstrate the "all weather" utility that customers expect of SUVs. Teams are measured on a low coefficient friction surface by accelerating from a complete stop and best accelerating through a straight line while maintaining vehicle control. The lowest time, while maintaining vehicle control, is used to grade competition vehicles.

The team demonstrating the highest score based on their traction control acceleration times will receive the award for the Best Traction Control and a check for \$500.

AVL DRIVE QUALITY

70 points

Event Captain: Randy Yost – General Motors

The balance between fuel economy and drivability is one of the most difficult and important tasks in the Vehicle Development Process. AVL DRIVE is the enabling technology used to objectively evaluate the drive quality of the competition vehicles. The objective of this event is to assess the vehicle's drivability through objective on-road evaluation. The event evaluates a set of driving "modes" such as acceleration, cruising, and braking that quantitatively assess the vehicle's drive quality.

The team with the highest drive quality score will receive the trophy for the Best AVL DRIVE Quality and a check for \$1,500.

TRAILER TOWING PERFORMANCE

40 points

Event Captain: Ralph Brazel – General Motors

The goal of this event is to demonstrate towing ability at a reasonable speed up a 16% grade. This drive schedule tests real world conditions that the production vehicle may experience. Teams are given three attempts at the 16% grade, and the team's slowest time is recorded for comparison. This effectively tests a team's ability to consistently pull such a load up a hill as opposed to a single attempt at peak performance.

The team that is able to travel the fixed distance of the towing cycle in the shortest time will receive an award for Best Trailer Tow and a check for \$500.



SCORED EVENTS AND AWARDS

ON-ROAD EMISSIONS TESTING

70 points

Co-Event Captains: Rachel Gerver and Jim Tulpa –
General Motors

Chassis dynamometer testing has traditionally been used for measuring tailpipe emissions from automobiles and light trucks. This approach provides a controlled environment and the ability to use large and accurate emissions sampling systems. However, recent developments in emissions measurement technology have given way to the opportunity of measuring tailpipe emissions from a vehicle as it is driven on-road, with the emissions sampling system located on-board the vehicle. In Challenge X, competing vehicles are driven over a pre-defined drive schedule that is similar in nature to laboratory-based emissions testing. Teams are required to demonstrate simultaneous control of key criteria emissions and will be scored based on an emissions bin-structure.

The team who achieves the lowest score based on the Challenge X emission bin-structure will receive a check for \$2,500 and a trophy for Lowest Regulated Tailpipe Emissions.

NOISE

10 points

Event Captains: Doug Moore and Tim Bohn – **General Motors**

Today's modern vehicle design requires low interior and exterior noise levels and quality to meet ever-increasing standards of refinement. Exterior noise levels are regulated as an emission in all markets, whereas interior noise levels and quality are an increasingly important factor in consumer decisions. Exterior noise levels are collected using drive-by audible measurements, while interior levels are recorded using binaural measuring techniques. Exterior noise measurements will be collected using the SAE J-1470 test, while interior noise data are measured separately using microphones and processed to obtain interior noise levels during a variety of real world driving conditions.

DYNAMIC CONSUMER ACCEPTABILITY

30 points

Event Captain: Todd Bruder – **General Motors**

The 99% buyoff level of readiness is represented dynamically by excellent vehicle NVH (Noise, Vibration, and Harshness) control and superior ride and handling performance. Noise and vibration should be controlled properly through powertrain mounts, proper intake and exhaust systems, interior and exterior noise abatement efforts, and overall perceived vehicle quality. Vehicle ride and handling should be at production levels in regards to vehicle systems such as the steering, brakes, and suspension. The objective of this event is to subjectively assess and score the vehicle's NVH and ride and handling performance. Teams will be evaluated using industry practices to determine the best dynamic consumer vehicle operation.

The team who achieves the highest score based on the combination of the Challenge X dynamic consumer acceptability evaluation and the lowest exterior and interior noise ratings will receive a check for \$2,000 and a trophy for Best Dynamic Consumer Acceptability.

STATIC CONSUMER ACCEPTABILITY

90 points

Event Captain: Carmen Markstrom – **General Motors**

Consumer acceptability is a key focus in the third year of Challenge X. The Static Consumer Acceptability (SCA) event is a combination of a team presentation and a vehicle inspection designed to evaluate the consumer acceptability of the team's vehicle. SCA evaluates the team's vehicle in four distinct sections: the driver area, general vehicle interior, general vehicle exterior, and vehicle startup. Added consumer features such as telematics, entertainment devices, and consumer convenience items will also be judged. Teams will give a presentation around their competition entry, where a panel of industry experts will evaluate their demonstrated consumer features.

The team who achieves the highest score based on the evaluation of the Challenge X judges, will receive a check for \$2,000 and a trophy for Best Static Consumer Acceptability.

WELL-TO-WHEELS GREENHOUSE GAS EMISSIONS

70 points

Event Captain: Stephen Gurski – **Argonne National Laboratory**

The objective of the well-to-wheels greenhouse gas event is to reduce greenhouse gas (GHG) emissions relative to a production vehicle based upon emissions measurements. The GHG emissions of each vehicle will be attributed to two components: (1) upstream fuel-cycle emissions, and (2) tailpipe emissions measurements. The maximum points for this event will be awarded to the vehicle with the lowest GHG score. Each vehicle will be assigned upstream GHG emissions based on the type and amount of fuel used during the on-road emissions event, according to a peer reviewed analysis of GHG emissions contained in the Greenhouse Gas, Regulated Emissions and Energy Use in Transportation (GREET) model.

The team with the lowest GHG score will receive a check for \$2,500 and a trophy for the Lowest Well-to-Wheels Greenhouse Gas Emissions.

ON-ROAD ENERGY USE

70 points

Co-Event Captains: Robert Monchamp and Larry Laws –
General Motors

The purpose of the on-road energy use event is to determine the energy use and fuel economy of participant vehicles. Vehicles are driven over a closed-loop road circuit with varying speeds, accelerations, and start/stops. The type of driving over the closed loop is designed to simulate normal real-world driving conditions.

The team that achieves the highest gasoline equivalent fuel economy will receive a check for \$2,500 and a trophy for the Best On-Road Energy Use.



WELL-TO-WHEELS PETROLEUM ENERGY USE

70 points

Event Captain: Stephen Gurski – Argonne National Laboratory

The well-to-wheels petroleum energy use event will determine a team's impact on the petroleum energy use of the vehicle. The reduction of petroleum energy usage on a well-to-wheels basis is a focus of the competition and is evaluated by this event. Petroleum energy use is determined from the fuel use demonstration during the on-road energy use event. Each competition vehicle consumes petroleum energy, either by use of the fuel to run the vehicle (tank-to-wheels) or used during the production of the fuel (well-to-tank).

The team that uses the lowest petroleum energy during the event will receive a trophy for the Lowest Well-to-Wheels Petroleum Energy Use and a check for \$2,500.

TECHNICAL PRESENTATION

55 points

Event Captain: Connie Bezanson – U.S. Department of Energy

The technical presentation event is a vehicle overview presentation designed to evaluate the effectiveness with which the team executed the year three deliverables of Challenge X. In a technical presentation format, teams will articulate their technical accomplishments and lessons learned from year three, along with future challenges for the final year of Challenge X. Particular emphasis is placed on understanding how teams have realized their overall design strategy, vehicle technical specifications, and vehicle architecture. Each team will make a technical presentation addressing key categories and then answer questions from a panel of industry and government experts. Scoring is based on presentation style and technical content.

The Best Technical Presentation Award (\$1,500) is presented to the team with the highest score in the Technical Presentation event.

VEHICLE TESTING COMPLETE PRESENTATION

70 points

Event Captain: Bob Larsen – Argonne National Laboratory

The Vehicle Testing Complete (VTC) presentation event is an around-the-vehicle presentation reviewing the hardware included in the hybrid powertrain system, details on the overall strategy employed to meet targets specified in a team's Vehicle Technical Specifications (VTS), and vehicle testing results showing the vehicle is at the 99% buyoff level of readiness. At this point of development, the vehicle should be complete, at a high level of refinement, and ready for final evaluation before being approved for production. Teams will show decision makers that their vehicle meets the VTS initially established by the teams.

Presentations should include information on measured performance in each of the key target areas established by each team for fuel economy, emissions, and performance targets as well as safety requirements that were achieved.

The Best Vehicle Testing Complete Presentation Award (\$1,500) is presented to the team with the highest score in the Best Vehicle Testing Complete Presentation event.

CONTROL STRATEGY PRESENTATION

55 points

Co-Event Captains: Chuck Folkerts and Kent Helfrich – General Motors

After developing a vehicle control strategy to utilize advanced vehicle technologies, each team will give a presentation and then answer questions from a panel of government and industry experts. The control strategy presentation is a focused technical presentation detailing the hybrid powertrain control strategy demonstrated for the competition in a team's vehicle. The presentation should include information on the controls hardware architectures and software strategies chosen, as well as details on the overall strategy employed to provide the required control of the hybrid powertrain system such that the safety, fuel economy, and performance targets are met.

The Best Control Strategy Presentation Award (\$1,500) is presented to the team with the highest score in the Control Strategy Presentation event.

OUTSTANDING OUTREACH AWARDS

40 points

Event Captain: Lynda Palombo – Natural Resources Canada

The purpose of the Challenge X Outreach Program is to use various outreach strategies to raise awareness about critical energy and transportation-related issues throughout North America. The Outreach Program specifically challenges teams to focus their outreach efforts on the following audiences: K-12 students, local communities (community groups, professional organizations, etc.), and local media. This year, particular emphasis was placed on securing media coverage in the team's local markets. Teams will submit a written summary of their outreach activities to be eligible for competition points. Teams may also compete for several sponsored outreach awards by giving an oral presentation to a panel of government and industry judges.

Outstanding Outreach, First Place (\$2,000), Outstanding Outreach, Second Place (\$1,500), and Outstanding Outreach, Third Place (\$1,000) are awarded to teams based on additional outreach activities. Best Youth Outreach Program (\$500), Best Community Outreach (\$500), Best PR/Media Outreach (\$500), Outstanding Website Award (\$500), and Best Sponsor Event (\$500) are awarded to the teams who go above and beyond the minimum point requirements.